
Supplementary information

Continuing kidney care in conflicts

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authors and unedited

Supplementary Table 1 | Key medical and logistic challenges faced by people with kidney disease (either remaining in place or displaced) and of kidney care providers during conflicts.

Patient group or disease	Medical Challenges	Logistical Challenges
Non-specific problems observed in patients irrespective of their diagnosis and whether they stay in the conflict area or relocate as refugees		
All non-communicable diseases	Inadequate and/or inappropriate nutrition, problems related to the inadequate treatment of other chronic diseases (mainly cardiovascular disease, hypertension, diabetes and cancer), mental illness (posttraumatic stress disorder, depression, suicide)	Unhealthy and insecure environments ^a , economic problems, damage to overall and healthcare infrastructures, shortages of medical supplies and personnel, inability to gain access to life-saving resources and/or facilities
Challenges specific to patients with kidney disease staying in the conflict area		
AKI	Increased incidence due to gunshot-related injuries and bleeding, crush or other injuries, exposure to noxious gases/agents, nephrotoxic medications	Shortage of nephrology personnel, medical devices, infrastructure, materials and dialysis possibilities, unsafe transport
CKD not requiring KRT	High risk of complications due to interruption in medical follow-up, treatment and suboptimal circumstances	Inability to gain access to anti-diabetic, anti-hypertensive, cardiovascular and other kidney disease medications
Maintenance dialysis	Complications due to impossibility or inadequacy of dialysis, increased risk for vascular or peritoneal access problems, infections	Shortage of dialysis units, personnel and disposables resulting in no dialysis or underdialysis. Travel to dialysis interrupted by curfews, impassable roads, danger. Theft of supplies
Transplant recipients	Complications due to interruptions in medications, high risk of infections due to living in unhygienic conditions	Inability to gain access to transplant clinics, immunosuppressive agents and transplant physicians. Theft of supplies.
Challenges specific to refugee kidney patients		
AKI	Life-threatening complications due to an inability to obtain dialysis, medication or an appropriate diet	Lack of dialysis access during displacement or after arrival at the destination
CKD not requiring KRT	Deterioration of kidney function, and/or associated complications due to an inability to obtain long-term care, medication or an appropriate diet	Interruption in medical treatment or appropriate diet during displacement or at destination
Maintenance dialysis	Life-threatening complications due to an inability to receive dialysis, or to obtain medication or an appropriate diet	Lack of dialysis possibilities during displacement or after arrival at destination
Transplant recipients	Increased risk of rejection, infection and other systemic complications due to an inability to obtain medications, and unhygienic conditions	Loss or theft of medication, inability to obtain immunosuppressive drugs and other medications, unhygienic conditions predisposing to infections

This table is not exhaustive and contains the most important points, according to the opinion of the authors. ^aTents, shelters, metro tunnels, in the conflict area, stations and stopover places during displacement. AKI, acute kidney injury; CKD, chronic kidney disease; KRT, kidney replacement therapy.

Supplementary Table 2 | Key medical and logistic challenges and solutions for providing kidney care during conflict

Problems	Solutions
Patients with kidney disease staying in the conflict area	
Unhealthy and insecure environments	Making available or requesting training on self-security measures in conflict circumstances
Inadequate / inappropriate nutrition	Stocking disposable eating utensils and canned and packaged rations of kidney-appropriate foods (low salt, low potassium); limiting fluid intake. Obtaining or offering training on nutrition in difficult conditions
Interruption in medical treatment	Keeping a reserve of extra medications for at least two weeks in their original containers as back-up Obtaining commitments for donations from industry; requesting support from other regions or countries
Under-dialysis	Strictly adhering to pre-defined dietary measures; limiting fluid intake
Limited dialysis possibilities	Providing a list of alternative dialysis units close to the original unit or living place Asking help from authorities and NGOs Considering PD in the case of life threatening complications that necessitate dialysis Referral/evacuation of patients to other regions or countries
Vascular or peritoneal access problems	Training patients to care for and monitor their access Asking for expert help as soon as a problem is identified Stocking catheters for emergency HD or PD access
Shortage of dialysis supplies	Keeping a two-week stock of dialysis supplies at all times Identify support possibilities / request support from authorities and/or NGOs Having contact numbers / website addresses of suppliers
Interruptions in immunosuppressive drugs	Keeping a two-week stock of immunosuppressive drugs Knowing medication names (if possible, generic names included) and doses Asking help from authorities, NGOs Having telephone numbers/email addresses of suppliers/pharmacists
High risk of infections	Taking measures for infection prophylaxis
Shortage of nephrology personnel	Careful preparation of on-call schedules Substitution of nephrologists by internists or general practitioners Using telemedicine Asking for personnel help from outside (other regions or countries)
Burnout of personnel	Taking measures to prevent burnout Seeking or offering expert help for prevention or treatment of burnout Providing a database of online support programs
Disorganization and chaos of care provision	Being prepared for disaster response, asking help of NGOs
Lack of knowledge by personnel on how to cope with emergencies	Applying guidelines, recommendations, asking for consultancy Remote support
Increased risk of malpractice	Providing and consulting multilingual educational materials for patients and providers Following standard of care guidelines Clear communication and documentation of patient information (attestation, preferably by medical professionals) Ask for support from outside the problem zone
Refugees	
Unhealthy and insecure environments during journey	Avoiding panic displacement, organizing planned evacuation Getting training on self-security measures, obtaining help from authorities or NGOs
Lack of dialysis possibility during journey	Strictly adhering to predefined dietary measures and fluid control
Lack of dialysis possibilities in the destination countries	Identifying support possibilities/asking for support from authorities or NGOs for organizing dialysis Strictly adhering to predefined dietary measures and fluid control Sharing knowledge of websites of major nephrology organizations, dialysis providers, health-related NGOs Preparing an explanatory letter with a list of medical issues, required medications, and dialysis prescriptions, in English (and if possible, in other appropriate languages)

Deterioration of primary kidney disease, increased risk of rejection, infection and/or associated complications	Preparing a letter with a list of medical issues and required medications (generic names included) in English (and if possible, other appropriate languages) Carrying stocks of medications (immunosuppressants, antihypertensives, antibiotics, and other critical medications) when travelling Asking authorities or NGOs for expert help
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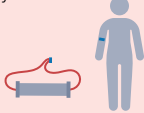
This table is not exhaustive and contains the most important points, according to the opinion of the authors. HD, haemodialysis; PD, peritoneal dialysis; NGO, Non-governmental organization.

Supplementary Table 3 | Key adaptations to KRT provision in extreme circumstances

Problems	Solutions
Decreased availability of human and material resources	Reduce dialysis dose especially in patients who have residual kidney function, and without signs of volume overload or hyperkalaemia Reduce dialysate flow Administer high-dose diuretics Consider non-potassium oral alkali therapy Ensure blood pressure and blood sugar control Consider dietary potassium restriction, potassium-lowering agents, or cathartics, especially in patients at risk of hyperkalaemia (including, if possible, reduction/replacement of intake of RAAS blockers) Establish local transparent rules on which patients should be prioritized in case dialysis capacity is limited Switch to PD
Unavailability of PD products	“Home-made” (in-hospital, pharmacy) IV fluids instead of commercial PD solutions (see ISPD Guidelines¹) Alternatives to PD catheters (Nasogastric and IV tubes) Switch to HD
Dialysis machine available, but no dialysis water	Consider convection only KRT (haemofiltration or ultrafiltration – very limited clearance but treats volume overload). May add replacement fluid and alkali if available to allow higher clearance
No HD machines	Consider stand-alone pumps ²
No physicians available	Train dialysis technicians to perform certain tasks, such as managing emergencies, hypervolaemia, adjustment of dialysis dose and dialysate composition, and treating access infection Train patients to perform certain tasks, such as self-disconnection Consider using telemedicine Request remote support
Decreased availability of disposables	Reuse filters, needles and tubes with manual cleaning (on the same patient for subsequent sessions) Switch to PD
Limited availability of anti-rejection agents	Consider high dose steroids if no other antirejection agents are available Switch to another formulation of the same or similar medication at equivalent doses (e.g. mycophenolate mofetil to mycophenolate sodium, or azathioprine) Switch between agents in the same class at equivalent doses (e.g. tacrolimus to cyclosporine) Switch CNIs to an mTOR inhibitor Reduce the CNI dose and add an inhibitor of Cytochrome P450 Take into account drug interactions (e.g. azathioprine with allopurinol) and contraindications (e.g. mycophenolate or mTOR inhibitors in pregnancy) when switching

Recommended measures are in addition to those recommended in Supplementary Table 2. CNIs, calcineurin inhibitors; HD, hemodialysis; KRT, kidney replacement therapy; PD, peritoneal dialysis; IV, intravenous; RAAS, Renin-angiotensin-aldosterone system.

1. Cullis, B. et al. ISPD guidelines for peritoneal dialysis in acute kidney injury: 2020 update (adults). *Perit Dial Int.* 41, 15–31 (2021).
2. Rifai, A.O. et al. Continuous venovenous hemofiltration using a stand-alone blood pump for acute kidney injury in field hospitals in Syria. *Kidney Int.* 87, 254–261 (2015).

Dietary measures	(for patients with no (or limited) dialysis options)	Avoid high-potassium food 	Decrease salt and fluids intake 	Decrease protein intake 
Additional measures	Haemodialysis	Seek emergency care if you have: • Severe weakness of the extremities • Swelling • Fistula problems • Fever • Chest pain • Trouble breathing 	Identify functioning dialysis units close to your location 	Learn how to disconnect from the haemodialysis machine yourself 
	Peritoneal dialysis	Seek emergency care if you have: • Abdominal pain • Cloudy dialysis fluid • High fever 	Notify local PD fluid company for prioritization of fluid delivery if you run out of supply 	Stock sufficient PD fluids and supplies for at least 2 weeks. Know contact numbers for suppliers 
	Transplant recipients	Seek emergency care if you have: • Decreased urine volume • Pain in the transplant kidney area • High fever 	Strictly apply infection prophylaxis measures 	Keep a 2-week stock of immunosuppressants. Replace expired drugs 

Supplementary Figure 1 | Considerations for patients living with kidney disease in the context of armed conflicts.

Disaster situations, such as armed conflict, are associated with additional risks for people living with kidney disease. These risks can be in part reduced with simple measures. General measures: 1. Designate a contact person; 2. Prepare a first-aid kit, 3. Get (or prepare) a report on your medical problems and treatment regimen, 4. Store enough medications for at least 2 weeks. In addition, have available masks, gloves, a thermometer, a can opener, hand sanitizer, a miniature flashlight, batteries, matches and candles. Stock disposable eating utensils and canned or packaged rations of foods. For people with diabetes: make sure that you have a blood glucose meter, extra insulin and syringes. Also, keep a supply of sugar, honey, candy in case of hypoglycaemia. PD, peritoneal dialysis. Adapted with permission from M.S. Sever, Department of Nephrology, Istanbul School of Medicine, University of Istanbul, Istanbul, Turkey.